GOES-R Program Update

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GLM AWG/R3 Science Team Meeting
Huntsville, AL
September 29-30, 2009

Outline

- Flight Status
- Proving Ground
  - HWT Spring Experiment
    - Convective Initiation
    - Lightning Detection, Trending
  - Future Plans
- GOES-R Risk Reduction
  - Innovative Ideas for Multi-instrument Blended Satellite Products
  - Visiting Scientist Program
  - JCSDA 2010 Data Assimilation Initiative
- Summary

http://www.goes-r.gov
http://cimss.ssec.wisc.edu/goes_r/proving-ground.html

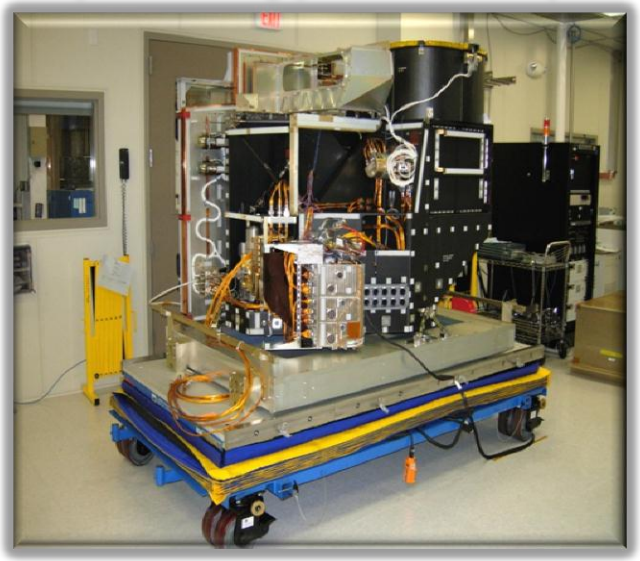
GOES-R Flight Status

Element	Function	Contractor	Status
Spacecraft	Platform for the environmental sensors and communications	Lockheed Martin Space Systems Company	Kick off -Sept 21
Advanced Baseline Imager (ABI)	*Primary Instrument:* Provides imagery of the Earth's surface, atmosphere and ground cover	ITT	Engineering unit in test
Geostationary Lightning Mapper (GLM)	Detects the frequency and location of lightning activity	Lockheed Martin Space Systems Company	Critical design underway* • CDR- Dry Run March 29 • CDR April 19
Space Environmental In-Situ Suite (SEISS)	Monitors the space environment	Assurance Technology Corporation	Critical design phase: Brassboard development
Extreme Ultra Violet / X-Ray Irradiance Sensor (EXIS)	Provides real time measurement of solar activity.	Laboratory for Atmospheric and Space Physics	Critical design underway
Solar Ultra Violet Imager (SUVI)	Observes the sun's emissions and provides early detection and location of flares	Lockheed Martin Space Systems Company	Critical design underway
Magnetometer	Measures the magnitude and direction of the Earth's magnetic field	Lockheed Martin Space Systems Company	Kick off -Sept 21

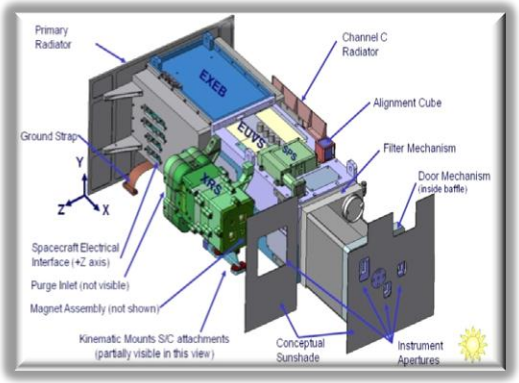
*GLM CDR schedule as of Sept 2009

Flight Technical Status

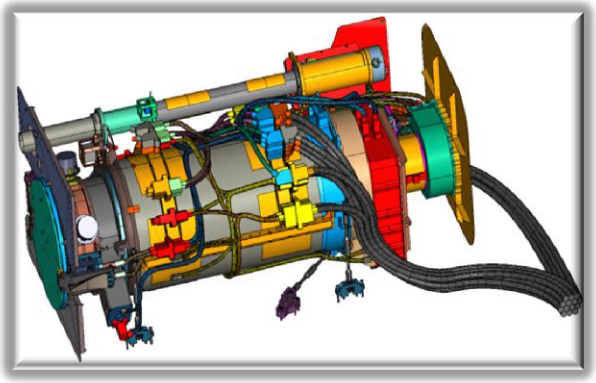
(ABI) Prototype Model (PTM)



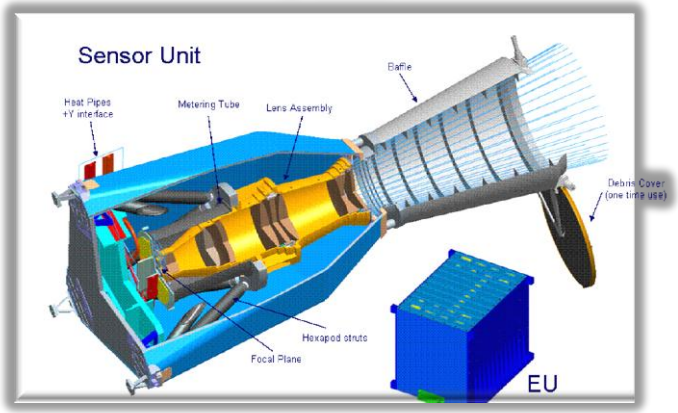
EXIS



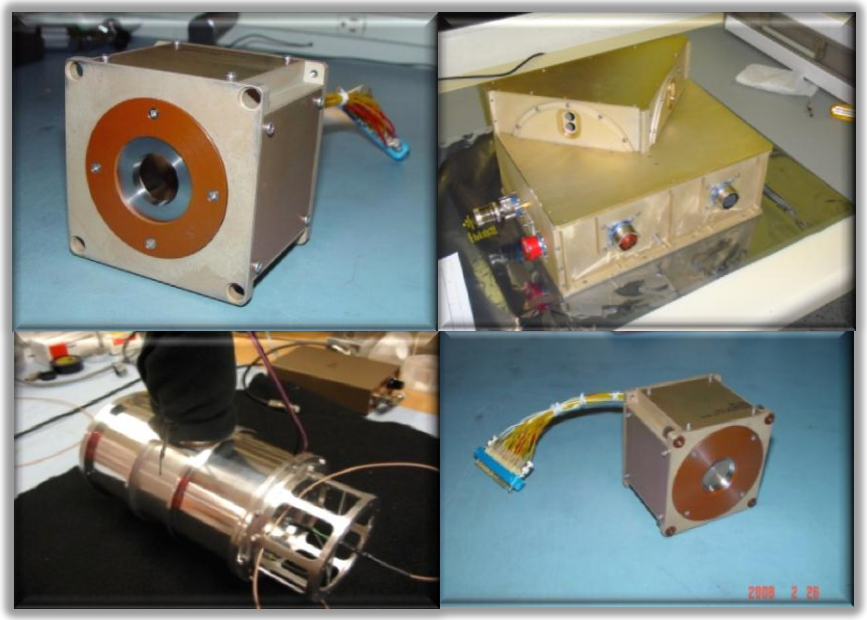
SUVI



GLM



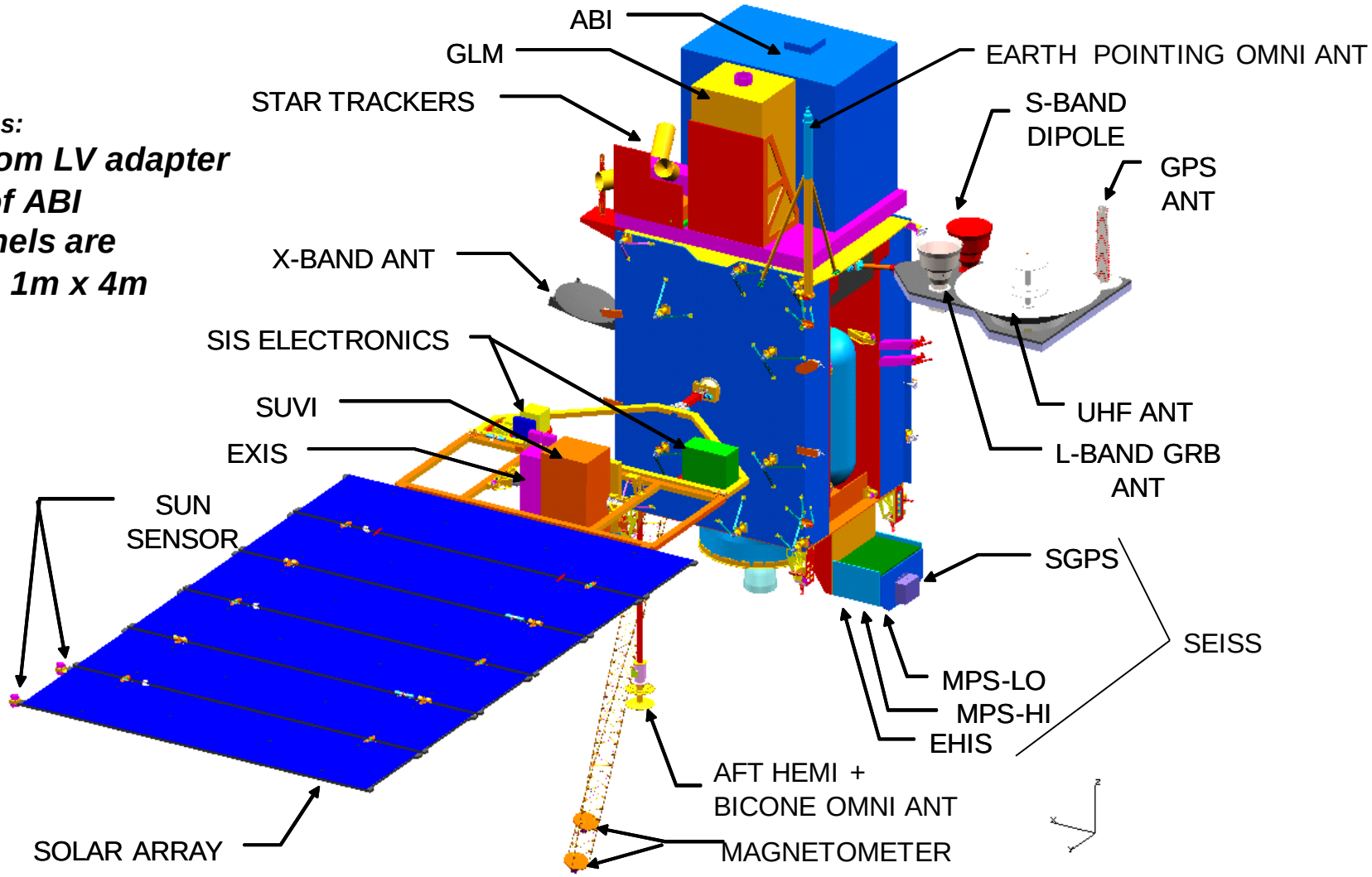
SEISS



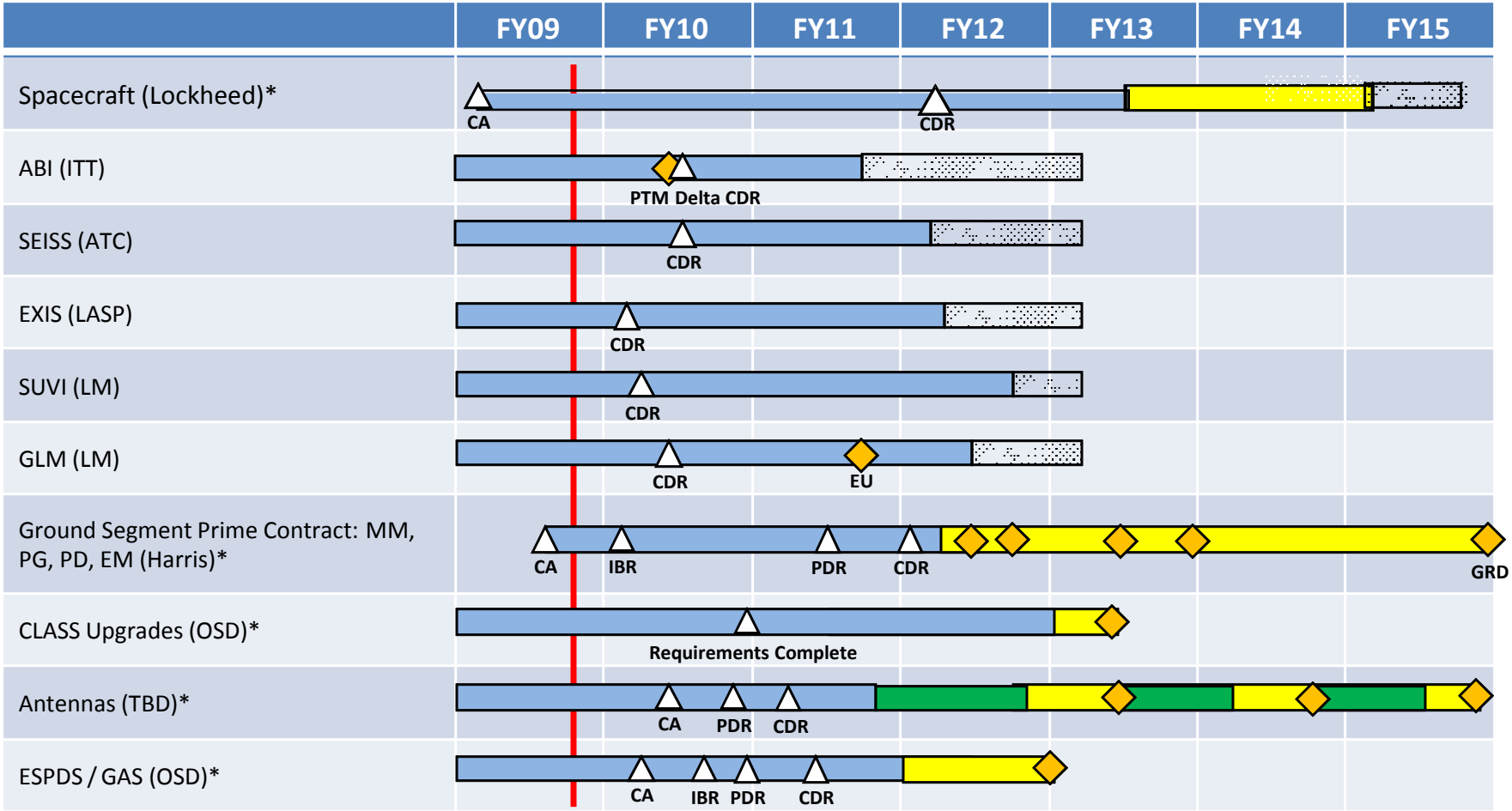
GOES-R Spacecraft

Dimensions:

- ***5.4m from LV adapter to top of ABI***
- ***S/A Panels are approx. 1m x 4m each***



GOES-R Program Master Schedule



*Schedule is notional until Integrated Baseline Review

△ Milestone ◆ Deliverable | Design/ Development | Construction | Integration/ Testing

GOES-R User Readiness

Risk Reduction (Mitigation)

GOES-R Algorithm/Product Readiness

Underpinning Research & Development (new applications & Day 2 Products)	Pre & Post Launch Sensor Calibration and validation	Operational Algorithm Readiness Development and Transition to Operations	Sustained Post Launch Validation and Reactive Science Maintenance	User Readiness
Risk Reduction	Calibration Working Group	Algorithm Working Group	Algorithm Working Group	• Proving Ground • Risk Reduction • Outreach • Training

GOES-R OPERATIONAL PRODUCTS

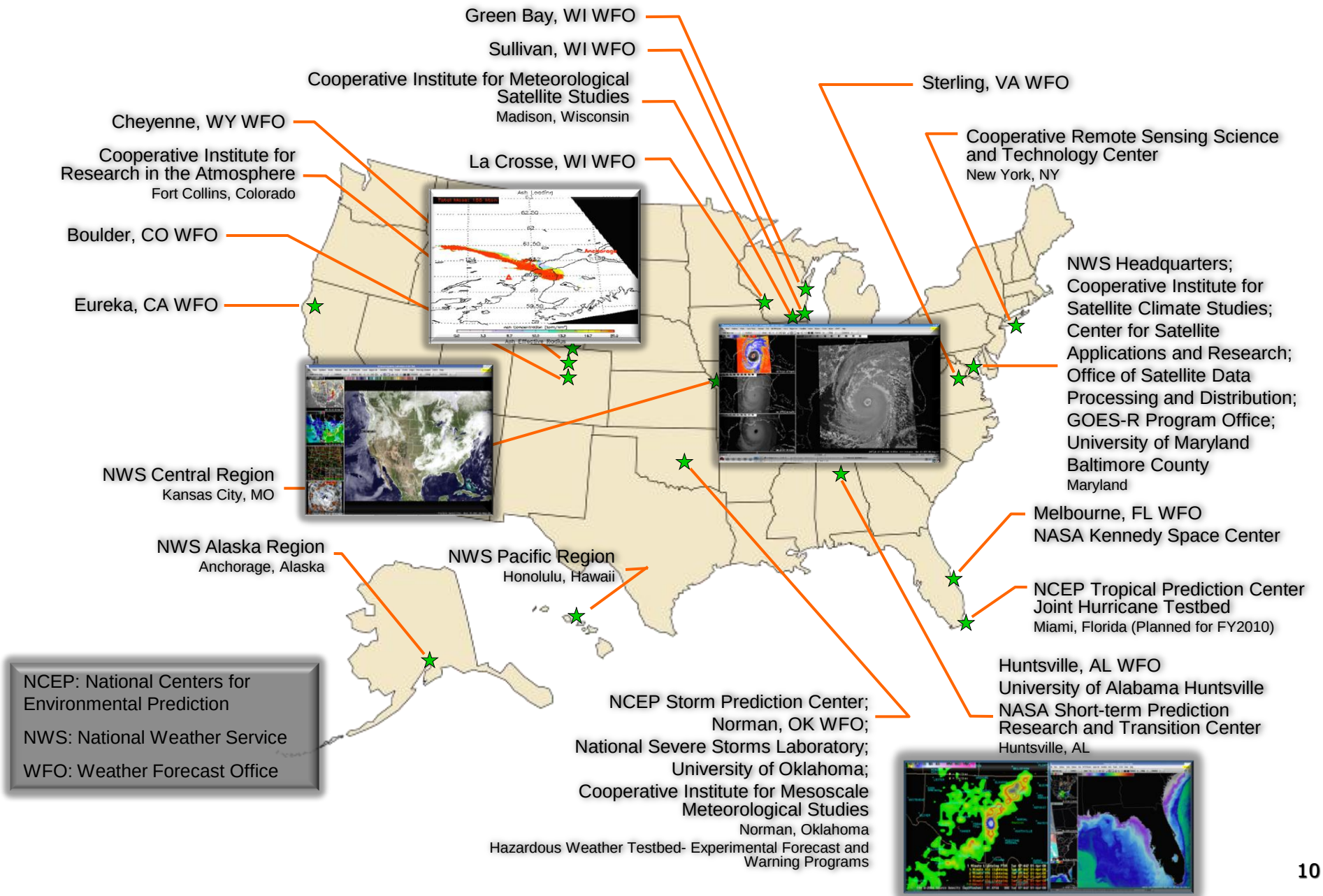
BASELINE (Continuity)

- Clouds and Moisture Imagery
- Clear Sky Masks
- Temperature and Moisture Profiles
- Total Precipitable Water
- Stability Parameters (Lifted Index)
- Cloud Top Pressure and Height
- Cloud Top Phase
- Cloud Particle Size Distribution
- Cloud Optical Path
- Rainfall Rate
- Aerosols Optical Depth
- Atmospheric Motion Vectors (AMVs)
- Hurricane Intensity
- Volcanic Ash
- Fire/Hot Spot Characterization
- Land and Sea Surface Temperature
- Snow Cover
- Downward Surface Insolation
- Lightning Detection

OPTION 2 (Enhanced Capability)

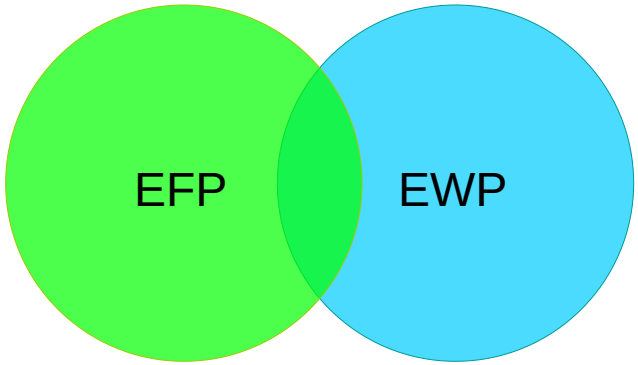
- Cloud Layer/Heights
- Cloud Ice Water Path
- Cloud Liquid Water
- Cloud Type
- Convective Initiation
- Turbulence
- Low Cloud and Fog
- Visibility
- Surface Albedo
- Upward and Downward Longwave Radiation
- Upward and Absorbed Shortwave Radiation
- Total Ozone
- SO2 Detections (Volcanoes)
- Surface Emissivity
- Aerosol Particle Size
- Vegetation Index
- Vegetation Fraction
- Snow Depth
- Flood Standing Water
- Rainfall probability and potential
- Enhanced “V”/Overshooting Top
- Aircraft Icing Threat
- Ice Cover
- Sea & Lake Ice Concentration, Age, Extent, Motion
- Ocean Currents.

GOES-R Proving Ground Partners



NOAA Hazardous Weather Testbed

Experimental
Forecast
Program



Experimental
Warning
Program

*Prediction of hazardous weather events from **a few hours to a week in advance***

*Detection and prediction of hazardous weather events **up to several hours in advance***

NATIONAL SEVERE STORMS LABORATORY
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Initial Products & Examples

Four GOES-R Proving Ground products available at the SPC for 2009 Spring Experiment

- 15-minute Cloud-top Cooling (CTC) Rate (UW-CIMSS)
  - Monitors cloud-top IR brightness temperature based on an operational cloud mask using a box-averaging method
- Convective Initiation (CI) Nowcast (UW-CIMSS)
  - Based on CTC product with more stringent requirements for cloud-top microphysical properties
- 10-km Total Lightning Source Density (SPoRT/NSSL)
  - Re-sampled from three LMA networks (Huntsville, AL, Washington DC and Norman, OK)
- 0-1 Hour Probability of Severe Hail (CIRA)
  - Based on RUC objective analysis fields and cloud-top temperature

2010 HWT Plans and Opportunities

- Provide select products for real-time testing within SPC operations

- Invitations and announcements for 2010 Spring Experiment in January/February… experiment likely begins in late April

- Expanded product suite possibilities
  - TPW/LI/CAPE
  - Continuous CTC
  - Enhanced-V/overshooting tops
  - GLM proxy-LMA 10-km flashes, density and pixel-based trends
  - Ingest LMA data from Cape Canaveral network
  - 0-6 hour severe hail, wind and tornado forecast
  - Others…

- Additional Experiments (spread out during the year)
  - Fire weather/heavy rain experiment (August)
  - Winter weather experiment (December/January)

- NWP- Short-Range Ensemble Forecasts (warn on forecast)

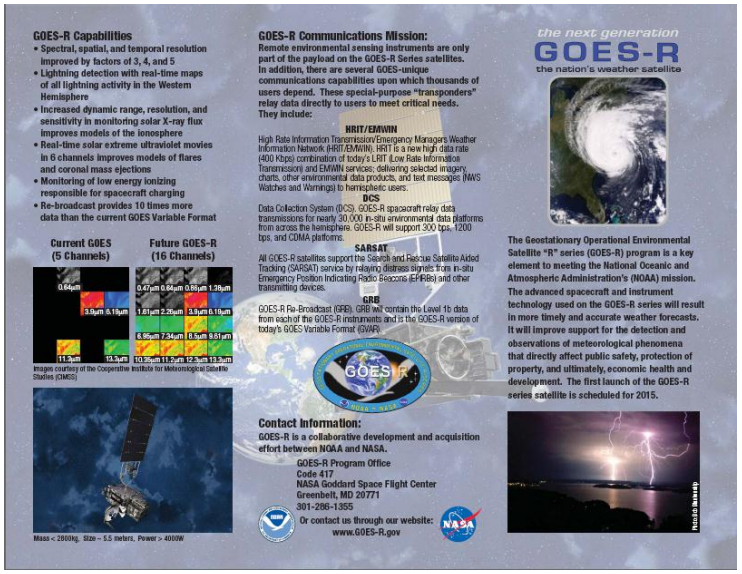
Proving Ground Summary

- Proving Ground Program Plan under development
- Phase I spin-up at CIMSS, CIRA (2008)
- Phase II added SPoRT, AQ, Alaska, Pacific
  - HWT IOP with VORTEX-2 (2009, 2010)
  - JHT IOP with GRIP (NASA), PREDICT (NSF) 2010
- Need real time and archived events (AWIPS2, WES)
- PG is the ultimate tool for user interaction
- Must maintain focus on clear path to operations
- Ensuring pathway into operations by developing GOES-R proxy products for the AWIPS2 environment
- Existing and Planned collaborations with NOAA Testbeds-HWT, JHT, DTC, HMT, JCSDA, others (Aviation Testbed)

Capacity Building and Outreach

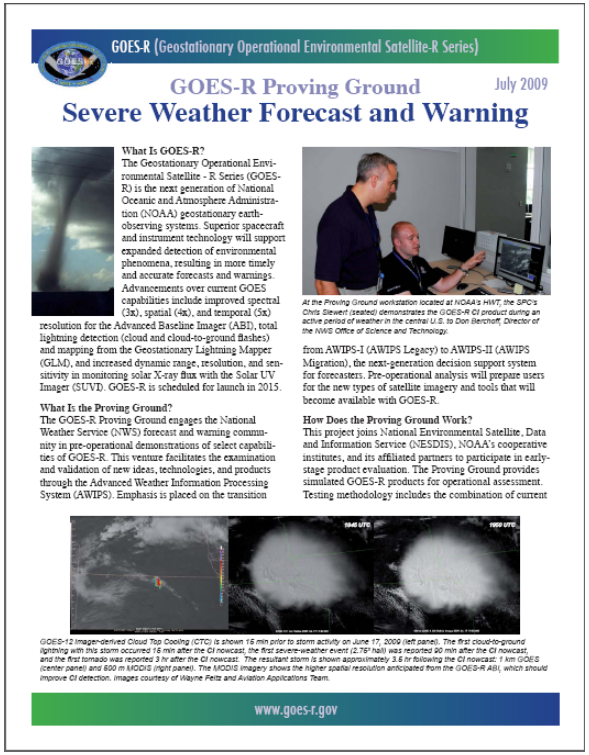
- GOES Users Conferences, Meetings, Symposia
  - Southern Thunder (ST09) held in July at Cocoa Beach, FL
  - GUC VI November 3-5, 2009 at Madison, WI
  - PG Annual Meeting May (25?), 2010 at Boulder, CO
  - AWG/R3 Annual Meeting, May-June, 2010 at Madison, WI
  - Pacific Region PG Meeting, July-August, 2010 at Honolulu, HI
- Outreach Materials
  - Fact Sheets for Proving Ground and Products in development- distribution targeted for NWA October, GUC VI November, and AMS January
  - Web site improvements underway
  - Tri-fold updated with spacecraft, 10K bookmarks for distribution
  - Training modules (COMET, VISITView)- GOES-R Overview completed
- 2 staff at NWS HQS to support Proving Ground planning and implementation
- 1 satellite champion at NOAA Hazardous Weather Testbed in Norman, OK
  - IOP held spring 2009, IOP planned for spring 2010
- 1 Data Assimilation visiting scientist at GSD/ESRL in Boulder, CO to develop HRRR/WRF capability- job announcement forthcoming
- 3 Data Assimilation scientists at EMC to develop 4D-VAR/EnKF capability

Capacity Building and Outreach



Tri-fold

Fact Sheet


GOES-R (Geostationary Operational Environmental Satellite-R Series)

GOES-R Proving Ground

July 2009

Severe Weather Forecast and Warning

What Is GOES-R?

The Geostationary Operational Environmental Satellite - R Series (GOES-R) is the next generation of National Oceanic and Atmosphere Administration (NOAA) geostationary earth-observing systems. Superior spacecraft and instrument technology will support expanded detection of environmental phenomena, resulting in more timely and accurate forecasts and warnings. Advancements over current GOES capabilities include improved spectral (3x), spatial (4x), and temporal (5x) resolution for the Advanced Baseline Imager (ABI), total lightning detection (cloud and cloud-to-ground flashes) and mapping from the Geostationary Lightning Mapper (GLM), and increased dynamic range, resolution, and sensitivity in monitoring solar X-ray flux with the Solar UV Imager (SUVI). GOES-R is scheduled for launch in 2015.

At the Proving Ground workstation located at NOAA's HWT, the SPC's Chris Siewert (seated) demonstrates the GOES-R CI product during an active period of weather in the central U.S. to Don Berchoff, Director of the NWS Office of Science and Technology.

What Is the Proving Ground?

The GOES-R Proving Ground engages the National Weather Service (NWS) forecast and warning community in pre-operational demonstrations of select capabilities of GOES-R. This venture facilitates the examination and validation of new ideas, technologies, and products through the Advanced Weather Information Processing System (AWIPS). Emphasis is placed on the transition from AWIPS-I (AWIPS Legacy) to AWIPS-II (AWIPS Migration), the next-generation decision support system for forecasters. Pre-operational analysis will prepare users for the new types of satellite imagery and tools that will become available with GOES-R.

How Does the Proving Ground Work?

This project joins National Environmental Satellite, Data and Information Service (NESDIS), NOAA's cooperative institutes, and its affiliated partners to participate in early-stage product evaluation. The Proving Ground provides simulated GOES-R products for operational assessment. Testing methodology includes the combination of current

GOES-12 Imager-derived Cloud Top Cooling (CTC) is shown 15 min prior to storm activity on June 17, 2009 (left panel). The first cloud-to-ground lightning with this storm occurred 15 min after the CI nowcast, the first severe-weather event (2.75° hail) was reported 90 min after the CI nowcast, and the first tornado was reported 3 hr after the CI nowcast. The resultant storm is shown approximately 3.5 hr following the CI nowcast: 1 km GOES (center panel) and 500 m MODIS (right panel). The MODIS imagery shows the higher spatial resolution anticipated from the GOES-R ABI, which should improve CI detection. Images courtesy of Wayne Feltz and Aviation Applications Team.

www.goes-r.gov

Book Marks

Innovative Ideas for Multi-instrument Blended Satellite Products

- New topical areas (phenology, energy applications)
- New investigators/team members are encouraged
- Projects that "bridge the gap" between current single-instrument or single-satellite projects (such as making connections between currently funded SSMIS and GLM projects focused on precipitation)
- Projects that result in portable applications with software following industry coding standards are encouraged
- Selections include:
  - Combining GOES-R (ABI+GLM) and GPM to improve GOES-R rainrate product
  - Using Hyperspectral POES Products to Improve GOES-R ABI Temperature/Moisture Profiles
  - Combined Geo/Leo High Latitude Atmospheric Motion Vectors (to fill gap between 60 and 70 deg latitude)

Visiting Scientist Program Initiative

- To exchange ideas and formulate cross-cutting proposals to explore innovative multi-sensor blended satellite products that will be possible in the GOES-R era
- Ideas can be explored in detail during visits of 1-4 weeks duration.
- 10 proposals selected for 2010 including:
  - 5 researcher visits of 1-2 weeks to Hazardous Weather Testbed/NCEP Storm Prediction Center (Aviation, Fire Weather, NWP)
  - CalNEX Air Quality/Trace Gas Field Validation Campaign participation
  - River flood product collaboration with NWS Office of Hydrology
  - ABI+GLM advanced products for aviation weather hazards (oceanic)
  - Martin Setvak (CMHI, NC-SAF) visit to CIRA- severe convection/clouds
  - Attendance at Nowcasting SAF 2010 User's Workshop
  - Cloud Algorithm Collaboration with NC-SAF, Swedish Hydrological and Meteorological Institute (SMHI) and CM-SAF Royal Dutch Meteorological Institute (KNMI)

JCSDA 2010 Data Assimilation Initiative

Funding Opportunity Title: Research in Satellite Data Assimilation for Numerical Weather, Climate and Environmental Forecast Systems

Funding Opportunity: NOAA-NESDIS-NESDISPO-2010-2001902 (Proposals Due October 13, 2009)

The JCSDA's goal is to accelerate the abilities of NOAA, DOD, and NASA to ingest and effectively use large volumes of data from current and future satellite-based instruments (over the next 10 years). Maximizing the impact of these observations on numerical weather prediction and data assimilation systems is a high priority of the JCSDA.

New for 2010:

Advanced Instruments (e.g. IASI, ASCAT, SSMIS, Jason-2/3, SMOS, Aquarius, ADM, CrIS, ATMS, **ABI, GLM**, GPM, and other planned research missions) are or will become available over the course of the next decade.

- Impact studies of assimilating future instruments data and products on the forecast of severe weather events (hurricanes, flash flooding, etc) at both global and regional scales.

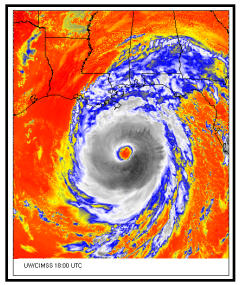
- Full announcement at JCSDA web site:http://www.jcsda.noaa.gov/ or through Grants-On-Line (www.grants.gov)
- Please contact Sid-Ahmed Boukabara with any questions (sid.boukabara@noaa.gov).

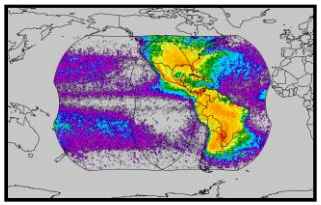
Summary

- GOES-R Flight Segment- sensors making great progress
  - ABI Prototype model in test
  - Other sensors heading towards Critical Design Review (CDR)
- GOES-R Ground Segment- development under way
  - Ground SRR October 27-30, Melbourne, FL
  - Major Contractor (Harris) onboard and working towards Integrated Baseline Review (November) and Preliminary Design.
  - Government Algorithm team making Great Progress on developing Mature ATBD
    - Successful ADEB Review August 27-28
    - The 80% algorithms on track for Sept 30 delivery
  - Starting some initial Cal/Val experiments
- GOES-R Proving Ground activities ensuring GOES-R readiness

6th GOES Users' Conference

http://cimss.ssec.wisc.edu/goes_r/meetings/guc2009/





Geostationary Operational Environmental Satellites: http://www.goes-r.gov

Special Event on 2 November: 50th Anniversary of the 1st Meteorological Satellite Experiment